

Challenges to strengthening agricultural innovation systems: where do we go from here?

Citation for published version (APA):

Hall, A. (2007). *Challenges to strengthening agricultural innovation systems: where do we go from here?* UNU-MERIT, Maastricht Economic and Social Research and Training Centre on Innovation and Technology. UNU-MERIT Working Papers No. 038

Document status and date:

Published: 01/01/2007

Document Version:

Publisher's PDF, also known as Version of record

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.umlib.nl/taverne-license

Take down policy

If you believe that this document breaches copyright please contact us at:

repository@maastrichtuniversity.nl

providing details and we will investigate your claim.

Download date: 06 May. 2023



**UNITED NATIONS
UNIVERSITY**

UNU-MERIT

Working Paper Series

#2007-38

**Challenges to Strengthening Agricultural Innovation Systems:
Where Do We Go From Here?**

Andy Hall

Challenges to Strengthening Agricultural Innovation Systems: Where Do We Go From Here?

Andy Hall¹,

Abstract

This paper was prepared to present at the *Farmer First Revisited: 20 Years On* conference at IDS, University of Sussex, UK, December 2007. Its focus is the challenge of strengthening agricultural innovation systems. The paper prefaces this discussion by reflecting on an apparent paradox. While agricultural innovation has never been better studied and understood, many of our ideas about innovation have failed to fundamentally change the institutional and policy setting of public and private investment intended to promote innovation for development. The paper asks “students of innovation” why a virtual spiral of innovation practice and policy learning hasn’t emerged. The paper then locates the current interest in innovation systems in the evolving and contested approaches to agricultural development, noting that this is characterised by a long history of false dichotomies. The contingencies of the emerging agricultural scenario will demand the more networked modes of collective intelligence and innovation that are embodied in the innovation systems concept. The paper argues, however, that the innovation systems idea should be viewed as a metaphor for innovation diversity, rather than another competing innovation narrative. The way forward, it is suggested, is to create a united front of different collective intelligence-based innovation narratives to kick-start the virtuous spiral of innovation practice and policy learning. This is needed to strengthen agricultural innovation systems and so achieve developmental goals. The paper argues that it is the responsibility of all us “students of innovation” to argue for this space for diversity to flourish and to help consolidate and promote what is known about agricultural innovation. If we aren’t more successful in stimulating institutional and policy change we will still be debating these issues 20 years hence.

Key words: Agricultural innovation systems; institutional and policy change; space for diversity; innovation narratives; collective intelligence; self-reflection.

UNU-MERIT Working Papers
ISSN 1871-9872

Maastricht Economic and social Research and training centre on Innovation and
Technology, UNU-MERIT

*UNU-MERIT Working Papers intend to disseminate preliminary results of research
carried out at the Centre to stimulate discussion on the issues raised.*

¹ Coordinator Learning, INnovation and Knowledge Network (LINK), United Nations University, MERIT, Maastricht, The Netherlands. hall@intech.unu.edu

Introduction: Why Are We Still Here?

I would like to preface this presentation on agricultural innovation systems with some reflection on the question of “why we are still here?” and use this reflection as a lens to look at the challenges to strengthening agricultural innovation systems.

Twenty years ago, at the time of the Farmer First conference, I was just starting a PhD at SPRU on agricultural innovation. This was an exciting time for a young and idealistic student fresh from agricultural development projects in Bangladesh. A new and powerful movement was taking shape in the international agricultural development community. It was a movement that was based on a simple, but compelling, narrative that many of us had witnessed first-hand: Farmers’ knowledge really does count!

Driving this movement was a loose coalition of social and natural scientists and practitioners who combined an interest in agricultural science and technology with an agenda of empowerment for the poor. The rest, as they say, is history, with these perspectives becoming a major feature of the development debate over the last 20 years.

Yet, if anybody had told me 20 years ago that we would still be having international conferences on the organisation of agricultural innovation for development I would not have believed them. Young and naive as was, I thought we had this problem sort! After all, even back then, us “students of agricultural innovation” (and by that I mean all of us here today) had a fairly clear idea of how agricultural innovation took place and what was preventing it — and those ideas seem to have broadly stood the test of time:

- innovation requires knowledge from multiple sources, including from users of that knowledge;
- it involves these different sources of knowledge interacting with each other in order to share and combine ideas;
- these interactions and processes are usually very specific to a particular context; and
- each context has its own routines and traditions that reflect historical origins shaped by culture, politics, policies and power.

Over the years we have come up with many ways of emphasising these different ideas, including farmer first and last; participation; PRA, PLA; public private sector partnerships; local innovation and so forth. We have also been successful in packaging and repackaging these ideas and (re)branding them. Agricultural innovation systems, a repackaging of ideas borrowed from our industrial development friends, is one such brand. It is an attractive idea and people like me have made a career out of trying to think through how to use it in agricultural development.

But before I start to talk about agricultural innovation systems, let us come back to this question of why we are still here? It seems to me that there is a paradox. The question of how to enable agricultural innovation for development is now discussed and researched more and better understood than ever before. At our disposal is a bewildering array of tools, manuals, case studies, frameworks, approaches, experiences and expertise. Yet, the

central challenge remains with us: the need to accelerate policy and institutional change in public (and, increasingly, private philanthropic) investments in agricultural science, technology and innovation for development.

This is not to say that the practices and policies of, for example, the CGIAR, donors and national governments and others have not changed. They have. However, there is still an uncomfortably large gap between what is known about enabling innovation for development and what is evident in mainstream policies and practices. The reason we are “still here” is precisely because of this gap and the tectonic pace at which it is narrowing.

It seems its becoming ever more urgent that all of us to reflect on our own and collective contributions to the institutional and policy changes needed to promote innovation. Do we need to change the way we work? Why aren't our own ideas, finely-crafted tools and approaches changing the world, unleashing the power of science and knowledge to create wealth, reduce poverty and preserve our environment?

It's a good question, and it's the same question we have been levelling at bio-physical scientists for years about the impact of their technologies on development.

You might ask what any of this has to do with my talk on strengthening agricultural innovation systems. Well, innovation systems could just be another development brand that comes and goes without making any difference. But what I want to argue today is that instead of seeing it as a new, and perhaps, competing approach, we view it as a metaphor for innovation diversity. In order to deal with the shocks and opportunities that the modern world throws at us, we need different approaches to innovation; different ways of bringing together ideas and technology. And we need to more effectively mobilise the innovation diversity that we currently have to cohesively argue for the sorts of policy and institutional change needed to create the space for further diversity to emerge – i.e. a virtuous spiral of innovation practice and policy learning.

Strengthening agricultural innovation systems is thus less about specific operational and policy recommendations — although clearly there are principles and generic issues. Rather, it is about ensuring that conditions that nurture eclectic approaches to innovation exist, and that competitors join forces with each other to constantly adapt institutional and policy framework conditions for innovation.

How well are we students of innovation, doing this?

Let me begin the rest of my talk by presenting some features of the current context that has given prominence to the idea of innovation systems in agriculture. I am then going to place this idea in the long history of debates about how agricultural research should be organised and how the nature of those debates has skewed the institutional development process. I will then take us forward to the future and explain why innovation is going to be critical for the agricultural sector and all those who depend on it. I will then conclude with some of the challenges of creating the virtuous spiral of innovation practice and

policy learning that I mentioned earlier. A substantial part of this challenge, I believe, concerns the way us students of innovation operate.

Agricultural Innovation: Second Time Around

Since the earliest days of development assistance, investments in agriculture through research and technology transfer have been central to rural development strategies. After falling from grace in the 1990s, a rush of new initiatives and the publication of the 2008 World Development Report on agriculture suggest that agriculture and agricultural science and technology are once again riding high in the development assistance world.

New this time around is the focus on innovation and the idea of innovation systems. The shift in view point that this signals is simple, but fundamental. If we are interested in development, and if we agree that development is about change, let us worry less about the supply of new knowledge and technology from research and concentrate instead on the conditions needed to demand and use knowledge to bring about that change.

There are now so many initiatives with an agricultural innovation component, many of them flagging their use of the innovation systems concept, that it is impossible to mention all of them here. Some are new and some, like the Innovation and Communication group at Wageningen Agricultural University, have been working with these ideas for many years. And this is not just the case in Anglophone regions and literature, but is a theme that is also emerging in Francophone West Africa and in Latin America.

Agricultural Science: A History of False Dichotomies

If one steps back from this new interest in agricultural innovation, it is possible to see this as part of a much longer story of arguments about how agricultural knowledge should be used for development. Some of our recent research on the evolution of the International Agricultural Research Centres found that this has been hotly debated by scientists since the 1960s.

These arguments include: Should plant breeding be conducted in on-station trials or in farmers fields? Should research be organised around commodities or around eco-regions? Should it take the form of traditional research, farming systems research or farmer participatory research? Is farmer knowledge superior to scientific knowledge? Should technology be modern or intermediate? What types of research lie in the public domain and what in the private? What constitutes international public good research and what is locally-relevant applied research and development?

For every convincing narrative of one position, there is an equally convincing counter-narrative: High yielding cereal revolutionised food production in Asia, but failed in Africa. Privatisation of seed supply systems improves client orientation in India, but not

in Bangladesh. Participatory plant breeding is more client-orientated, but genetic mark-assisted selection is cheaper.

The innovation studies literature has been good at categorising different styles of agricultural innovation and this, in combination with the efforts of practitioners to promote different approaches, has led to recognisable eras or paradigms of agricultural innovation. Table 1 (see below) presents an overview. The debates mentioned above among agricultural scientists and authors like myself (and table 1, 2 and 3 are illustrations of this) have tended to imply an “either/ or” dichotomy — it is *either* farming systems research *or* it is farmer participatory research. Of course, in reality, these approaches are additive, but our tendency is to promote the new by vilifying the old. This has left us with a debate characterised by a history of false dichotomies.

Table 1. Characteristics of different paradigms of agricultural innovation

Paradigm	Transfer of Technology	Farming Systems Research	Farmer First / Farmer Participatory Research	Interactive Learning for Change/ Innovation Systems
Era	Widespread since the 1960s, but building on a very long history	Starting in the 1970s and '80s	Starting in the 1990s	Work in progress
Organisation focus	Agricultural research organisation arranged as a National Agricultural research organisation	Agricultural research organisation arranged as a National Agricultural research organisation NARS	NARS as part of AKIS including agricultural extension and education organisations	NARS as part of agricultural innovation systems
Mental model of activities	Supply through pipeline	Learn through survey	Collaborate in research	Interact and learn for innovation
Farmers seen by scientists as	Progressive adopters, laggards	Objects of study and sources of info	Colleagues	Key actors among many others
Farmers' roles	Learn, adopt, conform	Provide information for scientists	Diagnose, experiment, test adapt	Co-generate knowledge, processes and innovation
Scope	Productivity	Input-output relationships	Farm-based	Beyond the farm gate
Core element	Technology packages	Modified packages to overcome constraints	Joint production of knowledge	Facilitated interactive innovation, learning and change
Driver	Supply push from research	Scientists' need to learn about farmers' conditions and needs	Demand pull from farmers	Responsiveness to changing contexts
Key changes Sought	Farmer behaviour	Scientists' knowledge	Scientist-farmer relationships	Institutional, professional and personal, affecting

				interactions and relationships between all actors
Intended outcome	Technology transfer and uptake	Technology produced with better fit to farming systems	Co-evolved technology with better fit to livelihood systems	Enhanced capacities to innovate
Innovators	Scientists	Scientists adapt packages	Farmers and scientists together	Potentially all actors
Intervention mode	Core funding of research and research infrastructure development	Core funding of research and research infrastructure development	Decentralised technology development and planning	Strengthening systemic capacity to innovate
Role of policy	Set priorities and allocate resources for research	Set priorities and allocate resources for research	Set priorities and allocate resources for research in consultation with different stakeholders	Integral part of innovation capacity. Strengthening enabling environment and support system coordination

Source: Adapted from an unpublished note by Robert Chambers, Andy Hall and others, and developed at IAASTD meeting Montpellier, France, 2005.

The same goes for the phasing that we have ascribed to different modes of innovation capacity building, although it does acknowledge slightly better the additive nature of these ideas (see table 3). These are useful presentational devices but seem somewhat at odds with the eclecticism that systems thinkers like myself would claim to espouse.

Table 2. The evolution of agricultural innovation capacity development frameworks

Defining features	Classic NARS	Classic AKIS (as defined by FAO-World Bank 2002)	Agricultural Innovation Systems
What this is	Organising framework for planning capacity for agricultural research, technology development and transfer	Organising framework for strengthening communication and knowledge delivery services to people in the rural sector	Organising framework to strengthen the capacity to innovate and create novelty throughout the agricultural production and marketing system
Who this	1. National Agricultural Research Organisations 2. Agricultural Universities or Faculties 3. Extension services 4. Farmers	1. National Agricultural Research Organisations 2. Agricultural Universities or Faculties 3 Extension services 4. Farmers 5. NGOs and entrepreneurs in rural areas	Potential all actors in the public and private sectors involved in the creation, diffusion, adaptation and use of all types of knowledge relevant to agricultural production and marketing.
Outcome	Technological invention and technology transfer	Technology adoption and innovation in agricultural production and marketing in rural areas	Combinations of technical and institutional innovations throughout the production, marketing,

			policy research and enterprise domains.
Organising principle	Using science to create knowledge. *** invention driven**	Accessing agricultural knowledge *** invention driven*	Creating change for social and economic change *** innovation driven**
Theory of innovation	Transfer of technology	Interactive learning	Interactive learning
Degree of market integration	Nil	Low	High
Role of policy	Resource allocation, priority setting	Enabling framework	Integrated component and enabling framework
Nature of capacity strengthening	Infrastructure and human resource development	Strengthening communication between actors in rural areas.	Same as NARS and AKIS and in addition, Combination of: strengthening linkages and interaction; institutional developments to support interaction, learning and innovation, the creating of an enabling policy environment

World Bank: 2006

Competing Coalitions

Of course neither of the opposing positions that emerge around these different dichotomies is entirely or universally true. As any seasoned agriculturist will tell you, the key to success is to be eclectic in one's choice of approaches and to tackle innovation as a "horses for courses" game of using what fits best. This would argue for letting a diversity of innovation approaches exist alongside each other, and, in the process, enriching the repertoire of innovation experiences at our disposal. However, for some reason academics (including myself) and decision makers do not seem to be able to grasp the importance of letting a thousand flowers bloom.

Instead, different positions on the organisation of agricultural science and innovation tend to be discussed in this polarised way along the lines of the false dichotomies mentioned above. And, of course, where dichotomies exist, contenting positions emerge and those with larger or more politically powerful coalitions of interest usually steer policy toward one approach at the expense of another. Our research on international agricultural research organisations indicates that, perhaps not surprisingly, time and time again it is the more conservative coalition that carries the day. Positive deviants — groups innovating in different and useful ways — have to be lucky, persistent and politically astute to stimulate institutional change.

This has unfortunate consequences for agricultural science and innovation policy-making. It means that the diversity of agricultural innovation experiences — precisely because of their very diversity and context-specificity — rarely forms a sufficiently coherent or

powerful coalition of interest to influence policy and institutional change. Farmer first / participatory research was one of those rare examples of a successful coalition, but even today there are major institutional roadblocks to such an approach.

More usually one sees many small groups of practitioners and researchers rallying around different innovation experiences, behaving competitively and often waging bitter turf wars instead of expending their energies collectively for policy change. With limited policy and institutional change, diversity is also stifled because routine ways of organising science and innovation become entrenched and incontestable.

Where do we have agreement?

Debates in the agricultural scientific community about how science should be organised are healthy and will continue, hopefully. One can, however, see a number of common themes emerging and there are two points about the changes illustrated in Table 1 that are worth emphasising.

As already mentioned the question of how to organise agricultural research to promote innovation has been with us for a long time. The fact that fortunes of some of the technology transfer and alternative paradigms have waxed and waned, however, does not necessarily mean that they should be judged inferior. Rather, they were often products of their time, suited to historical development scenarios. Furthermore, farming systems and participatory research paradigms were important institutional innovations and helped build up further knowledge on the relative merits of alternative ways of organising the innovation process. These models, in many senses, laid the foundations for the innovation systems paradigm — they legitimised the role of technology users (farmers) in the innovation process; they recognised that innovation draws information from multiple sources; they championed the idea of participation; and they saw how action research could be used to explore development phenomena that are complex and evolutionary in nature.

The actual idea of an innovation systems emerged in parallel with economic studies of industrialising countries (particularly in East Asia). Its central ideas, however, resonated with the institutional innovations taking place around agricultural research approaches in the 1990s and the increasingly globalised economic conditions that developing countries were facing. Of course, social equity and the need to improve the livelihoods of poor rural households in developing countries was an additional and unique concern for agricultural development policy. Innovation systems ideas, nevertheless, brought fresh thinking and impetus to the discussion of agricultural science technology and innovation in development that had, in many senses, got stuck in polarised debates, particularly about farmer knowledge and invention without tackling how this empirical knowledge could be integrated with scientific knowledge (Bell 2006).

The second and arguably most important point about these changing paradigms is the gradual shift from technology delivery to capacity strengthening and, specifically, the

capacity to innovate. Underlying this is the idea that to be effective in an ever-changing world a continuous process of innovation is required to adapt economic processes to presenting situations. I will return to this issue in a moment.

While there really does seem to be some consensus on the need to nurture networks of dense interaction for innovation across society, it does not mean opposing views have disappeared. However, those who continue to advocate for the “isolated islands of scientific excellence” mode of agricultural innovation capacity building seem increasingly out of step with agricultural futures, which are, in many senses, already with us.

Towards an Era of Collective Intelligence

What is interesting is that it is not necessarily agreement on approaches that is driving this move to consensus. Rather, it is the fear of an altogether different set of future agricultural scenarios where new and diverse modes of innovation are predicted to have enormous importance.

It is now clear that the agricultural sector is moving into an era of rapidly changing market, technological, social and environmental circumstances that are evolving in often unpredictable ways. This is an era where collective intelligences will replace centres of excellence and where the ability to use knowledge effectively in response to changing circumstances will define countries’ resilience to global shocks.

Coping and prospering in this new era will require scientists, policymakers, consumers and entrepreneurs to seamlessly organise their interactions in order to mobilise knowledge and continuously innovate in the face of change. A dream? Currently, yes. A necessity? No doubt about it.

Features of the future include:

- ***Multifunctionality***. The broad range of goals and interest groups the sector must serve: livelihoods for poor people, environmental sustainability, agro-industrial development, sector and technological convergence such as bio-fuels, food safety and eco-tourism.
- ***Collective intelligence***. There is no longer a single source of information and technology and bringing about innovation and change requires a collective intelligence involving collaboration between different knowledge sources.
- ***Rapidly advancing technological frontier***. The results of public and private R&D present new social and economic opportunities, but also raises new questions about societies’ relationship with science and its governance.
- ***Interconnectedness of scales***. Local production and livelihoods are increasingly connected to global preferences and trade standards through international value chains and to global phenomena like climate change and animal disease outbreaks.

- ***Knowledge use-related capacities as a new source of comparative advantage.***

The ability to use knowledge to innovate is emerging as a new source of comparative advantage, replacing the traditional importance of natural resource endowments as a source of competitiveness for developing countries.

- ***Increasing rate and non-linearity of change.*** This increasingly interconnected scenario with its multiple interest groups is contributing to the increasing pace of change and its non-linearity, due to the faster transmission of ideas and the wider set of interactions that now exist between markets, policies and technologies.

Not surprisingly, then, the idea of agricultural innovation systems has all of a sudden started to look very attractive to planners.

Agricultural Innovation Systems: A Personal State-of-the-Art

For every agricultural innovation systems specialist there is an interpretation of what this idea means. One definition is that an innovation system is the organisations, enterprises and individuals that demand and supply knowledge and technologies, and the policies, rules and mechanisms which affect the way different agents interact to share, access, exchange, and use knowledge (World Bank 2006).

There is now a very rapidly growing literature on agricultural innovation systems. My own work has had two major thrusts. First was a series of case studies where we used the framework to explore and explain different approaches to agricultural innovation. This, in turn, helped us firm up the idea of an innovation system as an analytical framework. The second thrust has been on operationalising the concept in the sense of using it diagnostically to help design interventions to strengthen innovation capacity (see Hall, 2007 for history).

These two thrusts were brought together in a study we conducted for the Agriculture and Rural Development (ARD) division of the World Bank, where we developed an analytical framework, tested it on case studies and then developed an intervention framework (see figure 1).

The main findings of the study, as one reviewer pointed out, weren't so much important because they were all new, but because they brought together these findings in one place and gave them prominence in the form of a World Bank study. The findings included:

- Innovation is rarely triggered by agricultural research and, instead, is most often a response of entrepreneurs to new and changing market opportunities.
- Promising sectors begin to fail because with everchanging market demands, patterns of interaction between entrepreneurs, farmers and other sources of technology and information are insufficient to support a knowledge-intensive process of innovation on a continuous basis.
- Lack of interaction weakens innovation capacity and is a reflection of deep-rooted habits and practices in both public and private sector organisations.

- The market is not sufficient to promote interaction; the public sector has a central role to play.
- Social and environmental sustainability are integral to economic success and need to be reflected in patterns of participation and interaction that are considered when strengthening innovation capacity.
- Mechanisms at the sector level that are critical for coordinating the interaction needed for innovation are either overlooked or missing.

The study made two now very familiar recommendations:

1. A major shift in interventions away from supporting agricultural research and with a new focus on strengthening patterns of interaction across the whole range of actors involved in innovation.
2. A priority within this new focus is to find ways of developing and adapting habits and practices that foster a capacity to innovate that integrates pro-poor and pro-market agendas.

Will this put farmers first? No, but it won't put them last either. Instead, it will help promote the idea of approaches that give equal weighting to different sources of knowledge, including that of farmers, but also others; and that recognises that there are multiple legitimate agendas in society, including those of the poor, but also those of industry and commerce, and pursuing both can contribute to development in different ways.

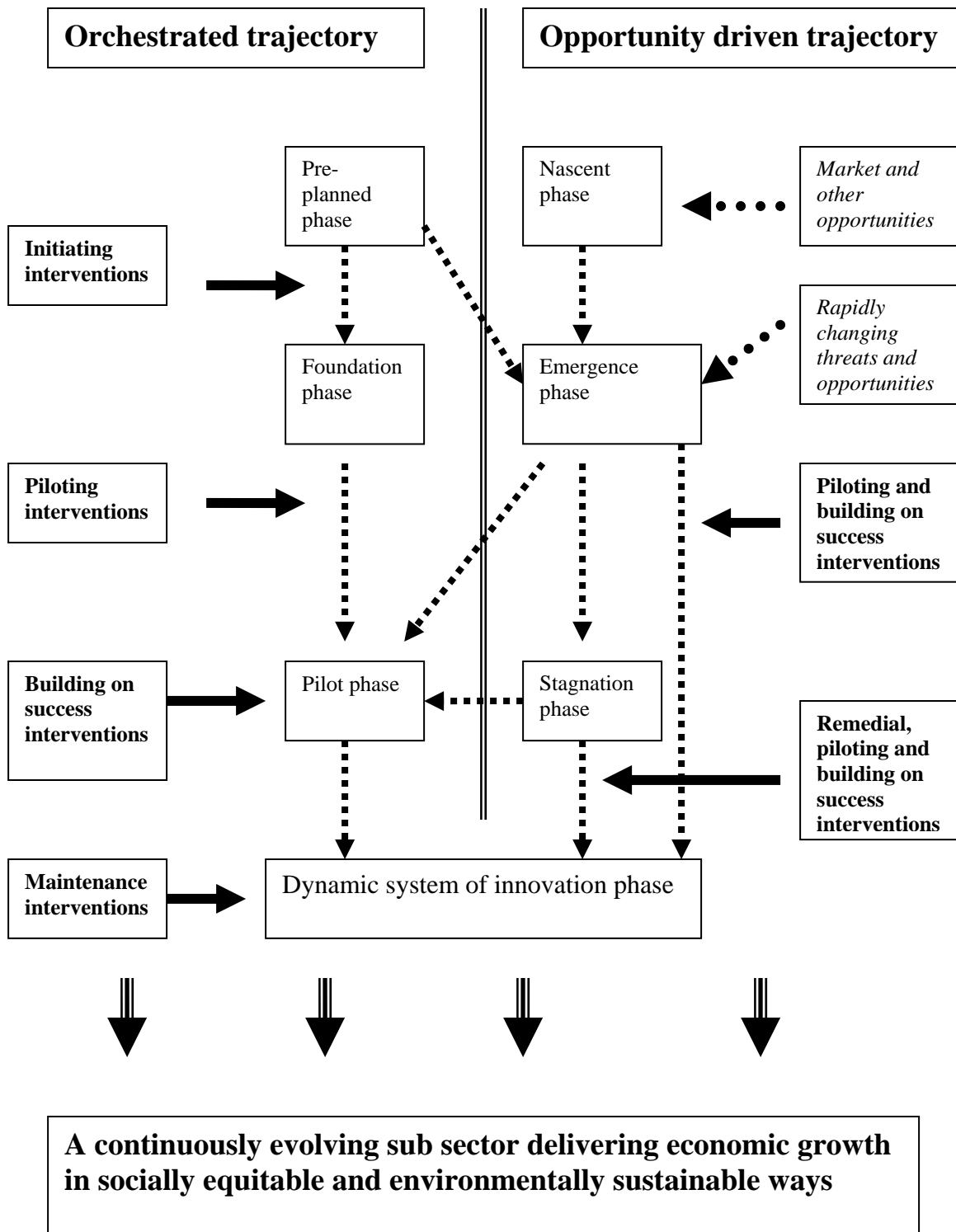
What still needs to be done? My sense is that the big challenges are operational. In particular, the idea of creating innovation capacities that are both pro-poor and pro-market. Further elaboration of the innovation systems concept, while interesting, is not the priority. What we need is a simple narrative that makes these ideas accessible and along equally user-friendly guidelines that helps put these ideas into practice. My own recent work (and that of my colleagues in LINK) has shifted from classic case study research/ publication mode, to mentoring, trying to implement these ideas and using action research to explore how to bring about the institutional and policy changes needed for a collective intelligence approach (for more on our work on fodder innovation go to www.innovationstudies.org and www.ILRI.org). We have found that this more operational focus has been far more difficult than our classic research work.

Another area of work that seems to be important is advice to policy and particularly innovation capacity bench marking. IFPRI/ISNAR have been working with the World Bank on innovation capacity indicators. There is still much more work to be done in this area as the systems view that we are all talking about suggests that a more participatory approach might be needed to supplement the more traditional science and technology indicators approach.

The reviewer of the World Bank study mentioned earlier made one further observation noting that the report was the first step towards building a world caucus on what is known about agricultural innovation. The suggestion was that building such a caucus could help

stimulate the wider institutional and policy changes that have yet to take place and which are needed to mainstream these ideas.

Figure 1 Intervention points in different innovation trajectories



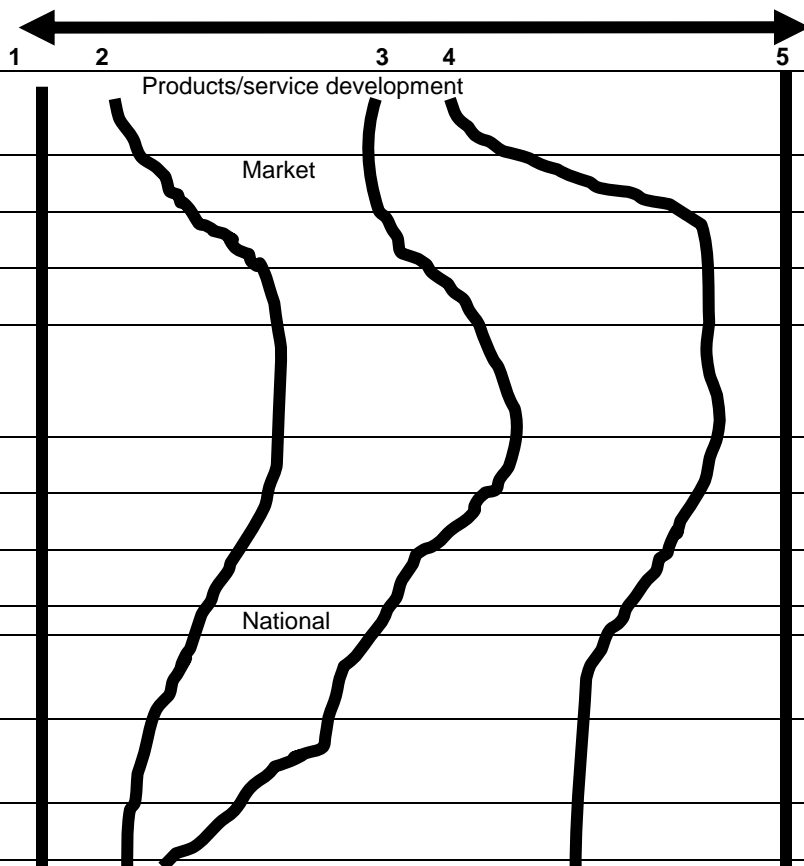
Another competing innovation narrative or a metaphor for diversity?

But is this just one more competing narrative of how agricultural science and innovation should be organised? Commentators accustomed to polarised narratives and blueprint approaches could understandably make the mistake of seeing this as another aspiring alternative. Of course, in many senses it is an alternative model, but what it does not do is make prescriptive recommendations along the lines of “for innovation to take place one must have a system with one private sector actor, one research actor, one banker, one policymaker and one farmer — all with pre-specified roles.” And this is where most people get confused.

Instead, it points out that what is required are coordinated networks of actors relevant to specific challenges or opportunities and locations — and accompanied by supporting policies and ways of working specific to those challenges, opportunities and locations. Recent work at LINK on the nature of innovation capacity suggests that a range of different types of innovation systems already exist and predicts that this diversity will increase in the future (Hall, 2005).

These systems range from public sector, science-driven systems working on food crop productivity, through private sector-coordinated networks innovating around value chains, to participatory partnerships between science and local communities focusing on natural resource management. They rely on scientific and others sources of knowledge to differing extents, and have different governance mechanisms. Some will be largely self-organising while others will need public intervention to organise interaction (See diagram below).

Figure 2: Features of different innovation systems

Knowledge system features/ domains ⁱ	Institutional features						Institutional features
Organising principle/ scope of task	Scientific research	1	2	3	4	5	Innovation/ socio-economic change
Responsiveness to different agendas	Curiosity						Poor people
Accountability for outcomes	Low						High
Knowledge types used	few/ codified						Many, codified and tacit inc indigenous
Degree of integration of different knowledge types	Low						High
Use of policy incentives	Low						High
Defining processes	Linear, reductionism						Reflective/ learning evolutionary systems
Ability to cope with change	Low						High
Scale	Global						Local
Priority setting	Prescriptive by scientist and economists						Consultative with different interest groups
Policy regimes	Narrow, S&T policy to guide research						Clusters of policy working together to promote innovations
Power / relationships	Unequal / hierarchical						Equal / flat
Knowledge flows	Top down						Multi-directional

Notes: 1 (big science, old CGIAR/NARS AKST); 2 (new CGIAR/NARS AKST); 3 (private sector AKST); 4 (Public-private sector partnership AKST); 5 (Pro-poor complex environments AKST)

My argument is that innovation systems is not another competing innovation narrative in the vein of past polarised debates. Instead, it is a metaphor to explain the principles behind the existence of a diversity of collective intelligence mechanisms for organising interaction for innovation — some more collective, some less so; some more participatory, some less so; some more pro-poor, some less so.

In the fast approaching future the agricultural sector will require this diversity in collective-intelligence mechanisms to meet its multiple agendas. It will also need a pattern of diversity that continues to evolve in order to cope with an ever-changing set of demands and opportunities that the sector will inevitably face. .

The Big Question

If one takes the innovation systems idea as a metaphor for diversity, it is possible to see a number of new ways forward that point to one critical unanswered question.

We can start, for example, by forgetting the dichotomy-style debates about whether we need to support local farmer innovation rather than private sector development of high value commodity chains or support traditional plant breeding rather than science-intensive biotechnology product development. We need all of these and more. And we need them to tackle a common challenge, the solution to which is going to be central to our ability to mobilise scientific and other sources of knowledge to cope and prosper in the future era of rapid change.

We urgently need to know how to organise these different sorts of interaction and build the right sorts of connections among relevant actors in society. And, at the moment, for the most part we haven't got a clue how to do this.

Creating Space for Diversity and Sharing Innovation Experiences

Ultimately, the question of organising interactions for innovation is a question of what policies and institutional regimes are going to be needed to make this happen, and happen in ways that best balance the trade-offs among societies' multiple goals. It appears there are two priorities here if we want to help stimulate institutional and policy change.

The first is to create the space for the diversity of different ways of organising interactions to emerge. The greater the diversity we create, the more innovation experiences there are to help us understand how best to organise for innovation. This, in turn, helps us develop policies and institutions that support the collective intelligence approach across the agricultural sector and the wider society it is located in. This is the virtual spiral of innovation practice and policy learning I mentioned in my introduction.

The problem here is that to bring about policy and institutional changes one needs sufficient diversity of innovation experiences to build our repertoire, draw generalities from and make the case for change. Often, however, policy and institutional settings stifle the diversity of approaches. Anybody working in large agricultural research organisations will know all too well the restrictions placed on doing things differently. I experienced this myself working with participatory research methods in East Africa in the earlier 1990s. We are experiencing it again in 2007 with the CGIAR's reluctance to accept FARA's Sub-Saharan Africa Challenge Programme to experiment with the development of what it terms an integrated agricultural research for development approach.

This is why policy and institutional change is important. Similarly, this is also why special projects and groups working at the margins of research organisations' mandates are so critical in making space for doing things differently. One can imagine a ratchet effect where new innovation experiences bring about small policy changes that, in turn, open up new space. However, the history of agricultural research and innovation suggests that this process is very slow.

Special projects, non-government organisations, and the private sector have been steadily generating different innovation experiences. Similarly the innovation studies community — while relatively small — has also built on a large body of different experiences and come up with a range of often overlapping policy perspectives on how to promote agricultural and rural innovation.

Maija Hirvonen recently completed a "LINK Tourist Guide to Agricultural Innovation Studies" (Forthcoming, 2007) and identified six distinctly different, although overlapping schools of thought on this topic.

- (i) The innovation and communications school, with its roots in agricultural extension and pioneered by the Wageningen group;
- (ii) The local innovation / farmers knowledge school, a very wide category with its roots in the Farmer First movement and with many representatives here today;
- (iii) The science and society school with IDS as a leading player;
- (iv) Rural innovation in alternative institutional settings with its roots in studying innovation in civil society and the pioneering work of Shambu Prasad and his unique genre of historical accounts of rural innovation;
- (v) The agricultural innovation systems school;
- (vi) The market chains and innovation school, championed by KIT, CIAT, and CIP/ Papa Andean/ Condesan in Latin America.

On reflection there probably should be a category for Boru Douthwait's learning selection genre of studies and one for the institutional histories approach that Boru and his colleagues from CIAT have developed. And I am sure that the list could be extended. Note here my tendency to categorise and pigeonhole these different sets of innovation narratives.

So why then haven't these different innovation experiences been better deployed in institutional and policy change? I believe the underlying problem here is related to the

issue raised earlier about the way the diversity of approaches and experiences has led to atomisation and contending coalitions rather than coherence and collective learning.

The second priority for helping with institutional and policy change is therefore to mobilise the existing diversity of innovation experiences. At first glance it might seem that there is little common ground in these experiences. What is common, however, is the experience of *how* to successfully organise interaction for innovation.

In practical terms, what this means is establishing mechanisms and structures to facilitate the sharing of these experiences across the global agricultural and rural development community — including practitioners, policymakers, donors, entrepreneurs and scientists. This sort of approach is usually referred to as a Community of Practice approach.

Do we need it? Well, it seems quite clear that currently the “space” and process to effectively share different innovation experiences and ideas are absent. In the same vein, the disconnected efforts of different innovation groups have not been sufficient to kickstart the institutional and policy change process at a sufficient scale or speed. To answer my introductory question, this is why we are still here today and it is something all of have a responsibility to address.

So if we are really serious about agricultural innovation systems as a way of achieving our development goals, we must to reflect on the sorts of alliances and activities needed to consolidate and share what is known about innovation — in all its diverse forms — and to share these experiences in an effort to stimulate the virtuous spiral of innovation practice and policy learning.

If we don't do this I can look forward to attending another conference in IDS on the same issues at around the time I start to collect my pension in 2027.

References

Bell. M (2006) Background paper for the L20 workshop on Furthering Science and Technology, March 2006 UNU-MERIT Maastricht
http://www.l20.org/publications/21_sY_Sci_background_Bell.pdf>

Hall, A.J. 2005. “Capacity Development for Agricultural Biotechnology in Developing Countries: An Innovation Systems View of What It Is and How to Develop It. *Journal of International Development* 19(5): 611-630.

Hiroven. M. 2007 (forthcoming) A tourist guide to Systems Studies of Rural Innovation. LINK Policy Resources on Rural Innovation Series. No. 1. LINK: Hyderabad, India

World Bank (2006) Enhancing Agricultural Innovation: How to go beyond the Strengthening of Research Systems. Economic Sector Work report. The World Bank: Washington DC pp149

The UNU-MERIT WORKING Paper Series

- 2007-01 *Developing science, technology and innovation indicators: what we can learn from the past* by Christopher Freeman & Luc Soete
- 2007-02 *The impact of innovation activities on productivity and firm growth: evidence from Brazil* by Micheline Goedhuys
- 2007-03 *Estimations of US debt dynamics: Growth cum debt and the savings glut in Kouri's model* by Thomas Zieseemer
- 2007-04 *States and Firms on the Periphery: The Challenges of a Globalising World* by Gabriel R.G. Benito & Rajneesh Narula
- 2007-05 *How Do Consumers Make Choices? A Summary of Evidence from Marketing and Psychology* by Zakaria Babutsidze
- 2007-06 *Inter-firm Technology Transfer: Partnership-embedded Licensing or Standard Licensing Agreements?* by John Hagedoorn, Stefanie Lorenz-Orlean & Hans Kranenburg
- 2007-07 *The Behavior of the Maximum Likelihood Estimator of Dynamic Panel Data Sample Selection Models* by Wladimir Raymond, Pierre Mohnen, Franz Palm & Sybrand Schim van der Loeff
- 2007-08 *Location and R&D alliances in the European ICT industry* by Rajneesh Narula & Grazia D. Santangelo
- 2007-09 *How do social capital and government support affect innovation and growth? Evidence from the EU regional support programmes* by Semih Akcomak & Bas ter Weel
- 2007-10 *The Micro-Dynamics of Catch Up in Indonesian Paper Manufacturing: An International Comparison of Plant-Level Performance* by Michiel van Dijk & Adam Szirmai
- 2007-11 *Financial Constraint and R&D Investment: Evidence from CIS* by Amaresh K Tiwari, Pierre Mohnen, Franz C. Palm & Sybrand Schim van der Loeff
- 2007-12 *The Spatial Hierarchy of Technological Change and Economic Development in Europe* by Bart Verspagen
- 2007-13 *The origins and implications of using innovation systems perspectives in the design and implementation of agricultural research projects: Some personal observations* by Andy Hall
- 2007-14 *Technology supply chain or innovation capacity?: Contrasting experiences of promoting small scale irrigation technology in South Asia* by Andy Hall, Norman Clark and Guru Naik
- 2007-15 *Are firms that received R&D subsidies more innovative?* by Charles Bérubé & Pierre Mohnen
- 2007-16 *Foreign direct investment and firm level productivity. A panel data analysis* by Geoffrey Gachino

- 2007-17 *Technological spillovers from multinational presence towards a conceptual framework* by Geoffrey Gachino
- 2007-18 *Technological capability building through networking strategies within high tech industries* by Wim Vanhaverbeke, Bonnie Beerkens and Geert Duysters
- 2007-19 *External technology sourcing: the effect of uncertainty on governance mode choice* by Vareska van de Vrande, Wim Vanhaverbeke & Geert Duysters
- 2007-20 *Exploration and Exploitation in Technology-based Alliance Networks* by Wim Vanhaverbeke, Victor Gilsing, Bonnie Beerkens, Geert Duysters
- 2007-21 *ICT Externalities: Evidence from cross country data* by Huub Meijers
- 2007-22 *Knowledge Flows, Patent Citations and the Impact of Science on Technology* by Önder Nomaler & Bart Verspagen
- 2007-23 *R&D offshoring and technology learning in emerging economies: Firm-level evidence from the ICT industry* by Zhe Qu, Can Huang, Mingqian Zhang & Yanyun Zhao
- 2007-24 *The Environmental Porter Hypothesis: Theory, Evidence and a Model of Timing of Adoption* by Ben Kriechel & Thomas Ziesemer
- 2007-25 *Measuring the Effectiveness of R&D tax credits in the Netherlands* by Boris Lokshin & Pierre Mohnen
- 2007-26 *The productivity effects of internal and external R&D: Evidence from a dynamic panel data model* by Boris Lokshin, René Belderbos & Martin Carree
- 2007-27 *National System of Innovations and the role of demand. A cross country comparison* by M. Abraham Garcia-Torre
- 2007-28 *The Global Challenges of the Knowledge Economy: China and the EU* by Can Huang and Luc Soete
- 2007-29 *Redefining Foreign Direct Investment Policy: A Two Dimensional Framework* by Sergey Filippov & Ionara Costa
- 2007-30 *Redefining the Nexus between Foreign Direct Investment, Industrial and Innovation Policies* by Ionara Costa & Sergey Filippov
- 2007-31 *Innovation and Competitive Capacity in Bangladesh's Pharmaceutical Sector* by Padmashree Gehl Sampath
- 2007-32 *R&D collaboration networks in the European Framework Programmes: Data processing, network construction and selected results* by Thomas Roediger-Schluga & Michael J. Barber
- 2007-33 *Determinants of alliance portfolio complexity and its effect on innovative performance of companies* by Geert Duysters and Boris Lokshin
- 2007-34 *Strategic Partnering with Chinese companies: Hidden motives and treasures* by Geert Duysters, Tina Saebi & Dong Qinqin
- 2007-35 *Approach for analysing capabilities in latecomer software companies* by Rossitza Rousseva
- 2007-36 *Foreign-owned firms and technological capabilities in the Argentinean manufacturing industry* by Ionara Costa & Anabel Marin

- 2007-37 *Short-term effects of new universities on regional innovation* by Robin Cowan and Natalia Zinovyeva
- 2007-38 *Challenges to Strengthening Agricultural Innovation Systems: Where Do We Go From Here?* By Andy Hall
